Mining

Lubrication & Services

Operating **sustainably and responsibly** everyday.

TotalEnergies

TotalEnergies
a multi-energy company

With a presence in **more than 160 countries**, TotalEnergies is a strong partner of choice for fuel and lubricants for its customers. TotalEnergies develops **a broad range of high quality lubricants products** through innovation and technology leadership. Each product is designed to suit customer-specific needs for use in the harshest conditions.

TotalEnergies continuously **invests in R&D**, cooperates closely with equipment manufacturers, and carries out field tests to **improve product formulations**, **ensure maximum performance**, and **minimise customers' operating costs.**

In addition, **we offer a range of specialized services** to support customers in optimizing their operations, extending equipment life, and reducing maintenance costs.

5800
Employees

130
Researchers

160
Countries

Our Services

Equipment-Specific Inspections

Regular equipment inspections are essential to ensure safety, reliability, and optimal performance in mining operations. This guide highlights the key areas to inspect for loaders and draglines, focusing on critical components such as hydraulic systems, structural integrity, and operator controls.

By identifying wear, damage, or malfunctions early, these inspections help prevent costly breakdowns, improve efficiency, and maintain compliance with safety standards.

Shovel Inspections

Boom stick:
Check for wear, cracks, and excessive play. Verify lubrication and the condition of pins, bushings, and seals.

Hydraulic Cylinders:
Inspect for scratches and dents, check piston rod seals, and verify oil levels in the reservoir.

Gearboxe:
Check for leaks, noise, and proper gear alignment. Verify oil level and condition.

Bearings:
Inspect for overheating, excessive play, or contamination.

Cab and Operator Controls:
Inspect for damage, proper functionality, and safety equipment like seat belts and mirrors.

Loader Inspections

Bucket, Frame, and Axles:
Check for cracks, dents, and alignment.

Hydraulic Cylinders:
Inspect for leaks, scratches, and correct oil levels.

Transmission:
Ensure no leaks, noise, and proper shifting.

Steering System:
Verify for loose components and proper response.

Tires:
Check for wear, cuts, and adjust pressure as needed.

Dragline Inspections

Boom, Mast, and Bucket:
Inspect for cracks, dents, and alignment.

Hoist and Drag Ropes:
Check for wear, kinks, and proper tension.

Hydraulic System:
Inspect for leaks, noise, and verify pump functionality.

Electrical Components:
Ensure proper connections and functioning.

Cab and Operator Controls:
Verify for damage and functionality of controls and safety equipment.

Open Gear Inspections

Open gears require regular maintenance to ensure optimal performance and longevity. This section provides an overview of the types of open gears, key inspection steps to identify wear or misalignment, and best lubrication practices to prevent damage and enhance efficiency.

// Open Gears Types

Spur Gears

These are the simplest type of gear, with parallel teeth that mesh with each other.

Bovel Gears

Gears with conical teeth that mesh at an angle. They are used to transmit power between shafts that are not parallel.

Worm Gears

Gears with a helical worm that meshes with a worm wheel. Worm gears are highly efficient and can reduce speed and increase torque.

// Inspection Procedures

Visual Inspection:
- Inspect the lubrication quality of the working flanks, both visually and by recording spray patterns (full covering of the working flanks).

Measurement of Backlash and Alignment:
- Measure the backlash between the gear teeth.
- Verify that the gears are properly aligned to ensure smooth operation and prevent excessive wear.

Lubricant Condition Assessment:
- Inspect the lubricant for signs of contamination, oxidation, or degradation.
- Check the lubricant level and condition.
- Test the lubricant's viscosity to ensure that it is appropriate for the application.

Open Gear Lubrication

Types of Open Gear Lubricants:

- Open gear lubricants are typically greases or oils that are specifically formulated for use on exposed gears.
- The choice of lubricant depends on factors such as the gear material, operating conditions, and environmental factors.

Application Methods:

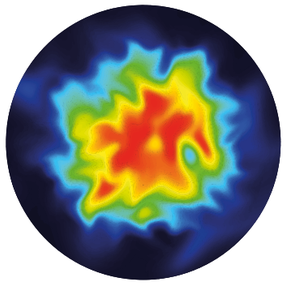
The four most common lubrication methods are:
- Splash lubrication
- Circulation lubrication
- Automatic spray lubrication
- Manual lubrication

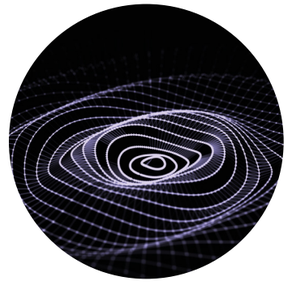
Lubrication Intervals:

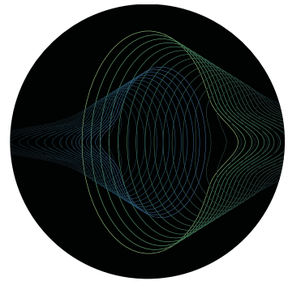
- The lubrication intervals for open gears depend on factors such as the gear material, operating conditions, and the lubricant used.
- Regular lubrication is essential to prevent wear, pitting, and other damage.

Condition monitoring techniques

Advanced techniques such as infrared thermography, vibration analysis, and ultrasound are used to continuously monitor equipment conditions, prevent failures, and optimize performance.







Infrared Thermography (IRT)

Principles:
Measures infrared radiation to detect temperature differences invisible to the human eye. Hotter objects emit more infrared radiation.

Applications in Mining:
Identifies overheating in bearings, motors, and gearboxes; detects hot spots in hydraulic and electrical systems; monitors critical components to prevent failures.

Overheating Components:
Scans for elevated temperatures, compares values to manufacturer limits, and identifies components exceeding thresholds.

Vibration Analysis

Mechanical Vibration:
Caused by physical movement of components (e.g., rotating shafts).

Electrical Vibration:
Results from fluctuations in current or magnetic fields.

Measurement Techniques:
Uses sensors to measure vibration amplitude, frequency, and phase. Data is analyzed to identify issues.

Applications in Mining:
Detects bearing faults, shaft misalignment, and imbalances, which can cause operational disruptions.

Ultrasound

Principles of Ultrasound:
Uses high-frequency sound waves to monitor equipment by detecting defects, leaks, and anomalies.

Applications in Mining:
Detects hydraulic system leaks, monitors bearings and gears, and identifies cavitation in pumps/valves.

Leaks & Damage Detection:
Scans for acoustic emissions, analyzes data to detect issues, and compares to baseline conditions for accurate diagnostics.

Lubrication System Audits

Lubrication System Components

Reservoirs: *These are containers that store lubricants.*

Pumps: *Pumps are used to circulate lubricants throughout the system.*

Filters: *Filters remove contaminants from lubricants, such as dirt, water, and wear debris.*

Piping: *Piping is used to transport lubricants throughout the system.*

Hoses: *Hoses are flexible pipes that are used to connect components in the lubrication system.*

Fittings: *Fittings are used to connect pipes and hoses.*

Lubricant Injectors: *Injectors are used to deliver lubricants to specific points in the equipment.*

Comprehensive audits of lubrication systems aimed at maximizing their efficiency. These services include optimizing lubrication intervals, selecting appropriate lubricants, and providing recommendations for optimal management.

Audit Procedures

Visual Inspection:
Check the system for leaks, damage, or corrosion; inspect pipes, hoses, fittings, and components to ensure cleanliness and good condition.

Pressure and Flow Rate Checks:
Measure pressure and flow rates, compare them to manufacturer specifications, and identify any deviations.

Lubricant Quality Analysis:
Collect samples to analyze viscosity, acidity, and water content, then compare the results to standards.

Injector Inspection:
Inspect injectors for wear or blockages to ensure proper lubricant flow and operation.

Improving Lubrication System Efficiency

Optimization of Lubrication Intervals:
Analyze usage history to determine optimal schedules, avoiding over- or under-lubrication.

Proper Lubricant Selection and Storage:
Use compatible lubricants stored in clean, dry conditions, following manufacturer recommendations.

Regular Maintenance and Cleaning:
Perform regular maintenance, clean components to remove contaminants, and replace worn or damaged parts as needed.

Total Fluid Management (TFM)

Comprehensive audits of lubrication systems aimed at maximizing their efficiency. These services include optimizing lubrication intervals, selecting appropriate lubricants, and providing recommendations for optimal management.

TFM Principles

Integrated Approach to Managing All Fluids in a Mining Operation:
TFM focuses on managing all types of fluids used in a mining operation, including lubricants, hydraulic fluids, coolants, and fuels.

Benefits of TFM:

Cost Savings:
TFM can help reduce costs by optimizing fluid usage, minimizing waste, and extending the life of equipment.
Improved Reliability:
TFM can improve the reliability of equipment by ensuring that fluids are of the correct quality and are used properly.
Reduced Environmental Impact:
TFM can help reduce the environmental impact of mining operations by minimizing fluid spills and waste.

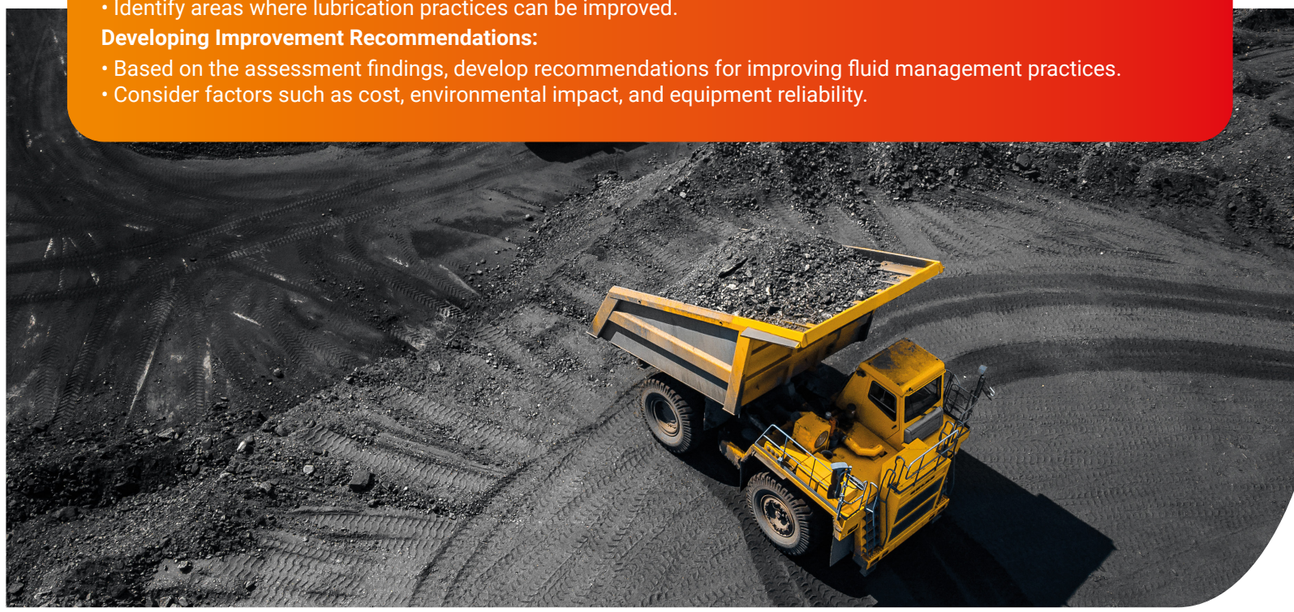
TFM Assessment

Identifying Fluid Usage Patterns:
- Analyze the consumption of various fluids in the mining operation.
- Identify areas where fluid usage can be optimized or reduced.

Assessing Fluid Quality and Condition:
- Collect samples of fluids from various points in the operation.
- Analyze the samples to assess their quality and condition.
- Identify any contaminants or degradation that may be affecting equipment performance.

Evaluating Lubrication Practices:
- Assess the effectiveness of lubrication practices, including lubrication intervals, lubricant selection, and application methods.
- Identify areas where lubrication practices can be improved.

Developing Improvement Recommendations:
- Based on the assessment findings, develop recommendations for improving fluid management practices.
- Consider factors such as cost, environmental impact, and equipment reliability.



On site Training and Online Ressources

On-site training and online resources help mining teams enhance their skills in inspection, lubrication, and safety, ensuring safer and more efficient operations.

On-Site Training

Customized Training Programs Tailored to Specific Mining Operations:

- Training programs can be designed to address the unique needs and challenges of individual mining operations.
- Factors to consider when customizing training programs include the types of equipment used, the operating environment, and the specific skills and knowledge required by employees.

Hands-on Training in Equipment Inspection and Maintenance:

- Hands-on training provides employees with practical experience in inspecting and maintaining mining equipment.
- This type of training can help employees develop the skills and confidence needed to perform their jobs effectively.
- Hands-on training can also be used to demonstrate proper techniques and procedures for equipment inspection and maintenance.

Online Training

E-learning Modules for Self-Paced Learning:

- E-learning modules offer a flexible and convenient way for employees to learn at their own pace.
- These modules can cover a variety of topics, including equipment inspection, lubrication techniques, and safety procedures.
- E-learning modules can be accessed on computers, tablets, or smartphones.

Access to Online Resources and Knowledge Base:

- Online resources and knowledge bases can provide employees with access to information and support.
- These resources may include technical manuals, troubleshooting guides, and FAQs.
- Online resources can be a valuable tool for employees who need to access information quickly and efficiently.

Oil sample analysis and condition Monitoring

Oil sample analysis and condition monitoring help detect early signs of wear, contamination, or failure in equipment. By evaluating key parameters such as viscosity, wear metals, and contaminants, these services provide precise insights into asset conditions and assist in optimizing maintenance.

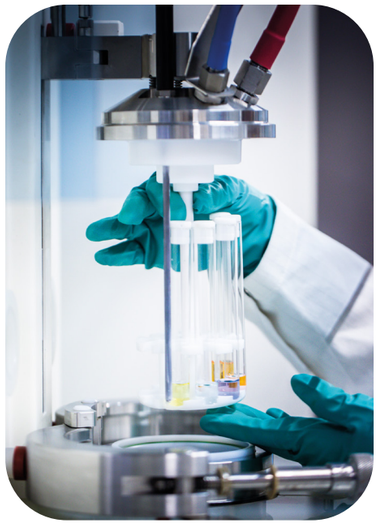
Oil Sample Collection

Proper Sampling Techniques:

- Use clean, contaminant-free sampling equipment.
- Collect samples from the appropriate locations in the equipment.
- Avoid disturbing the oil during sampling.

Sample Labeling and Storage:

- Label samples clearly with the equipment identification, sampling location, date, and time.
- Store samples in a cool, dry place to prevent contamination and degradation.



Oil Analysis Techniques

Viscosity:

- Measure the viscosity of the oil to determine its resistance to flow.
- Changes in viscosity can indicate wear, contamination, or degradation.

Acidity:

- Measure the acidity of the oil to assess its oxidation level.
- Increased acidity can be a sign of oxidation or contamination.

Water Content:

- Measure the water content of the oil to determine the presence of contaminants.
- Water can cause corrosion, cavitation, and other problems.

Particle Count:

- Count the number of particles in the oil to assess the level of contamination.
- Increased particle counts can indicate wear, contamination, or other problems.

Wear Metals:

- Analyze the oil for the presence of wear metals to identify the source of wear in the equipment.
- The presence of specific wear metals can indicate wear in bearings, gears, or other components.

Condition Monitoring Reports

Interpreting Oil Analysis Results:

- Analyze the oil analysis results to identify any trends or abnormalities.
- Compare the results to baseline data or industry standards.
- Identify potential equipment problems based on the analysis results.

Identifying Potential Equipment Problems:

- Based on the oil analysis results, identify potential equipment problems, such as bearing wear, gear damage, or contamination.
- Prioritize the problems based on their severity and potential consequences.

Providing Recommendations for Corrective Actions:

- Develop recommendations for corrective actions to address any identified equipment problems.
- Consider factors such as the cost, time required, and potential consequences of the corrective actions.

Incident investigation, Analysis and reporting

Comprehensive incident investigation services, including root cause identification and the implementation of corrective actions to prevent recurrence.

Incident Investigation Process

Gathering Information:
- Collect information from witnesses, equipment operators, and other relevant personnel.
- Review relevant documentation, such as maintenance records, inspection reports, and safety procedures.
- Inspect the equipment involved in the incident to identify any physical evidence.

Identifying Root Causes:
- Use root cause analysis techniques to determine the underlying causes of the incident.
- Consider factors such as human error, equipment failure, and environmental conditions.

Developing Corrective Actions:
- Develop a plan to address the root causes of the incident and prevent similar incidents from occurring in the future.
- Consider factors such as the cost, time required, and potential consequences of the corrective actions.

Incident Analysis Techniques

Failure Mode and Effects Analysis (FMEA):
- Identify potential failure modes and their potential consequences.
- Evaluate the severity of each failure mode and the likelihood of it occurring.
- Develop preventive actions to reduce the risk of failures.

Root Cause Analysis (RCA):
- Identify the underlying causes of an incident using a systematic approach.
- Consider the five whys technique or fishbone diagrams to identify the root causes.

Incident Reporting

Documentation of Incident Details:
- Document the incident details, including the date, time, location, and description of the incident.
- Record any injuries, equipment damage, or environmental impact.
- Collect statements from witnesses and involved personnel.

Communication of Findings and Recommendations:
- Prepare a report summarizing the findings of the investigation and the recommended corrective actions.
- Communicate the report to relevant personnel, including management, safety professionals, and equipment operators.
- Implement the recommended corrective actions to prevent similar incidents from occurring in the future.

Cleanliness improvement solution

Practical solutions to control contamination and enhance equipment cleanliness through methods such as lubricant filtration, rigorous maintenance practices, and specialized training.

Sources of Contamination

External Contaminants:
- Dust, dirt, and other particulate matter can enter equipment through open vents, doors, or cracks.
- Airborne contaminants can be carried into equipment by air currents or personnel.

Internal Contaminants:
- Wear debris from equipment components can contaminate lubricants and hydraulic fluids.
- Water can enter equipment through leaks, condensation, or improper storage.

Cleanliness Practices

Equipment Cleaning and Maintenance:
- Develop a regular cleaning schedule for equipment and components.
- Use appropriate cleaning agents and procedures to remove contaminants.
- Inspect equipment for signs of wear, damage, or contamination.

Lubricant Filtration and Purification:
- Use filters to remove contaminants from lubricants and hydraulic fluids.
- Consider using purification systems to remove more stubborn contaminants.

Contamination Control Procedures:
- Implement procedures to prevent contamination from entering equipment.
- Train personnel on proper cleanliness practices.
- Use clean tools and equipment when working on equipment.

Implementing Cleanliness Solutions

Developing a Cleanliness Program:
- Develop a written cleanliness program that outlines the specific procedures and responsibilities for maintaining cleanliness.
- Assign roles and responsibilities to relevant personnel.
- Establish performance metrics to measure the effectiveness of the cleanliness program.

Training Personnel on Cleanliness Practices:
- Provide training to all personnel on proper cleanliness practices.
- Cover topics such as equipment cleaning procedures, contamination prevention, and the importance of cleanliness.

Monitoring and Auditing Cleanliness Performance:
- Regularly monitor the cleanliness of equipment and components.
- Conduct audits to assess the effectiveness of the cleanliness program.
- Identify areas for improvement and implement corrective actions.

A major player

With our production, supply chain and commercial presence in more than **160 countries,** we deliver a full range of lubricants.

Support and partnership

Thanks to local technical presence, we provide a high level of service to optimize your **Total Cost of Ownership.**

References & OEMs

TotalEnergies Lubrifiants cooperates with **equipment manufacturers** to create high-technology products for optimal **performance and production** of your machinery.

5

good reasons for choosing TotalEnergies Lubrifiants

Innovation & Research

TotalEnergies Lubrifiants invests in biotechnologies to find the most suitable components to reach **energy efficiency** through formulations designed in our Research Centers.

Quality & environment

TotalEnergies Lubrifiants **ISO 9001 and 14001certifications** are the guarantee of a **long term commitment** to quality and environment.
From the initial design stage, our R&D teams seek to develop products that **minimize toxicity risks** and environmental impact.

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